

REMARKS**Disposition of Claims**

Claims 29-46 and 49-58 are currently pending. Claims 29, 31, 33, 34, 36, 39, 41-44, 54 and 57 have been amended.

Claim Amendments

Independent Claims 29, 54 and 57 have been amended to strike the recitation of “derivatives” and to insert the definitions of carboxylic acid derivatives as provided on page 15, line 24, through page 16, line 2 of the English translation of the specification as filed. Additionally, Claims 29, 54 and 75 have been amended to more particularly define that diaminocarboxylic compounds recited in step (A) include acids and esters, as disclosed on page 19, lines 10-19, of the English translation of the instant specification.

Claims 31, 33, 34, 39 and 41-44 have been amended to comply with the antecedent basis rules.

Claim 36 has been amended to correct an obvious typographical error.

Rejection of Claims under 35 U.S.C. § 112, 2nd Paragraph

Claims 29, 30, 32, 34, 35, 37, 38, 44-46, and 48-58 are rejected under 35 U.S.C. § 112, 2nd paragraph as being indefinite. The Examiner stated that base Claims 29, 54 and 57 recite the term “derivatives” which is unclear.

Applicants amended base Claims 29, 54 and 57 to recite that the derivatives of carboxylic acids are their esters, anhydrides and halides. Applicants believe that these amendments address the Examiner’s objections.

Reconsideration and withdrawal of the rejection are requested.

Rejection of Claims Under 35 U.S.C. § 102

Claims 29-34, 36, 41-43, 48-50, and 52-58 are rejected under 35 U.S.C. § 102(b) as being anticipated by US Patent Publication 2004/0062969 (“Sakaguchi”).

The Examiner advanced a rejection based on inherency. The Examiner asserted that Sakaguchi teaches the steps A) through E) of base Claims 29, 54 and 57, but does not expressly

teach step F), partial hydrolysis of the polyphosphoric acid. The Examiner stated that the polyphosphoric acid moieties of the membranes of Sakaguchi are expected to inherently partially hydrolyze, thus resulting in the same product as the one claimed by the instant claims. The Examiner referred to paragraphs [0210] and [0254]-[0260] of Sakaguchi, and further relied on “Polyphosphoric Acid Assay” (“Innophos”), for their teaching that the polyphosphoric acid is hygroscopic and, therefore, is subject to partial hydrolysis under atmospheric conditions.

Applicants first note that in order to show that a process-by-product base Claims 29, 54 and 57 lack novelty, the Examiner needs to either demonstrate that a prior art reference teaches each and every step of the process, or that a product identical to the one claimed was otherwise prepared. In the instant case, however, no reference of record teaches either the steps recited in the base claims, or a product having identical properties to the ones claimed by the base claims.

Applicants submit that the Examiner’s argument that Sakaguchi inherently teaches all the steps of Claims 29, 54 and 57 is based on an incorrect interpretation of the teaching of Sakaguchi, including paragraphs [0210] and [0254]-[0260]. Specifically, Applicants note that these paragraphs teach *complete removal*, not partial hydrolysis, of the polyphosphoric acid moieties. For example, paragraph [0255] expressly states:

After completing the polymerization, the mixture was allowed to cool, poured into water, and the polymer obtained was repeatedly rinsed in a blender until pH test paper was neutralized. (*Emphasis added.*)

Because the pH is *neutral*, based on this description alone it is clear that *polyphosphoric acid was completely removed*, with no phosphoric acid left in the polymer. Whether this removal of polyphosphoric acid involved hydrolysis is irrelevant: even if the hydrolysis occurred, the resulting product is by necessity very different from the product of a process recited by pending Claims 29, 54 and 57 because the acid (hydrolyzed or unhydrolyzed) has been removed.

In fact, Applicants have previously argued this very point. In the Amendment submitted on April 17, 2007, pages 15-16, Applicants stated:

The membrane formation process claimed in the present Application is distinct from that described in the Sakaguchi reference based at least on step D). In the Sakaguchi reference, formation of the membrane requires first polymer formation, and then precipitation of the polymer by pouring it into

water. The precipitated polymer is then repeatedly rinsed. (See Examples 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 on pages 21 to 26 of the Sakaguchi application). As a result of the precipitation and neutralization of the polymer, it is clear that the polyphosphoric acid in Sakaguchi is removed before partial hydrolysis can occur. As such, it is evident that the polyphosphoric acid is not present in a partially hydrolyzed form in the membrane disclosed by Sakaguchi. In contrast, Applicants' membrane comprises partially hydrolyzed polyphosphoric acid moieties.

Moreover, any phosphoric acid present (hydrolyzed or unhydrolyzed) is removed from the material of Sakaguchi by washing *before* the material is applied to a solid support and a membrane is formed. In other words, at no point in the process of Sakaguchi is a *membrane* formed that contains polyphosphoric acid. In contrast, in Applicants' claims, partial hydrolysis occurs only after applying to the solid support. Thus, at no point along the Sakaguchi's process are the pending claims, drawn to a *membrane* that includes polyphosphoric acid anticipated because Sakaguchi never produces a membrane that includes polyphosphoric acid.

It is thus established that the process of Sakaguchi (polyphosphoric acid is removed) is different from the process of the instant base claims (polyphosphoric acid is retained, partially hydrolyzed). The difference between the products obtained by these different processes follows with necessity: the membranes of Sakaguchi do *not* contain polyphosphoric acid, while the membranes of Claims 29, 54 and 57 *do* contain such moieties.

Applicants further note that the material differences between the products of the present invention and the products described by Sakaguchi have been also previously addressed by Applicants. In the Amendment submitted on April 17, 2007, page 16, Applicants stated:

Additionally, Applicants' resulting membrane has distinct, highly advantageous properties over Sakaguchi and other prior art membranes for fuel cells. After treatment in step D), the membrane typically contains only about 5% b.w. polyzole polymer and 95% b.w. acid – even when “dry” the membrane is composed of more than 90% b.w. of liquids. This internal concentration of liquids that allows the Applicant's membrane to have superior conductivity at temperatures over 100°C. (See specification page 8, lines 4-8). The behavior of this membrane is similar to that of a super absorber with a gel-like, rubberish texture. The treatment step D) results in a membrane that has an interpenetrating network (IPN) internal structure. (See specification page 37, lines 16-28). Such material can not be obtained by simply dissolving the polymer taught by Sakaguchi and casting a film. The films that result from casting the Sakaguchi polymer are rigid, stiff polymers

that have distinct properties (physical, mechanical, and conductive) from the present invention. See specification, page 7 line 9 to page 8 line 8.

Additionally, the membranes claimed in the present invention are designed for use in high temperature fuel cells. The claimed invention provides membranes that have proton conductivity at high temperatures, e.g. 160°C, without humidification. In contrast, the membranes taught by the Sakaguchi application show proton conductivity only with humidification, e.g. at RH 95%. Such humidification can only be done at low temperature, e.g. at 80°C. The Sakaguchi membranes can not function at or near the temperature range of the claimed membranes – hence the materials are distinct.

In summary, both the process and the product described by Sakaguchi are different from those claimed by Applicants. As such, base Claims 29, 54 and 57, as well as claims dependent thereon, are novel over Sakaguchi.

Reconsideration and withdrawal of the rejection are requested.

Rejection of Claims Under 35 U.S.C. § 103

Dependent Claims 35, 37-40, 44, 45, 46, 51 are rejected over a combination of Sakaguchi in view of Matsuoka, Gerber, Nakao, Akita or Kerres, previously of record. Applicants respectfully disagree.

Sakaguchi is discussed in detail above. Sakaguchi does not teach or suggest the membranes with polyphosphoric acid moieties.

The secondary references each teach polymers made up of monomer units that may be used in the present invention, but do not teach or suggest membranes with partially hydrolyzed polyphosphoric acid moieties. Therefore, none of the deficiencies of Sakaguchi are overcome by the combination of references.

Reconsideration and withdrawal of these rejections is respectfully requested.

CONCLUSIONS

The pending claims have been amended as necessary to more particularly point out and distinctly claim the invention. No new matter has been added. In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue.

If the Examiner feels that a telephone conference would expedite prosecution of this application, she is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By Alexander Akhiezer

Alexander Akhiezer, Ph.D.

Registration No. 54,617

Telephone: (978) 341-0036

Facsimile: (978) 341-0136

Concord, MA 01742-9133

Dated:

7/28/03